

What is claimed is:

1. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a user into an assembled condition, and said connection system comprising:

a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the catheter when said distal end of said connection stem is received therein;

b. a catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with the longitudinal axis of said connection stem; and

c. grip enhancement means for constraining the outer wall of the catheter to traverse a tortuous path when said distal end of said connection stem is received in the lumen of the catheter and said securement collar and said connection stem are in said assembled condition of said connection system.

2. A system as recited in Claim 1, wherein said grip enhancement means comprises:

a. an enlargement formed on the exterior of said distal end of said connection stem, said enlargement terminating at a proximal end thereof in a barrier wall encircling said connection stem; and

b. a catheter locking ring on the interior of said securement collar at the distal end thereof, said locking ring in said assembled condition of said connection system being positioned proximal of said enlargement on said connection stem encircling said exterior of said connection stem.

3. A system as recited in Claim 2, wherein said barrier wall of said enlargement is oriented generally perpendicularly to said longitudinal axis of said connection stem.

4. A system as recited in Claim 3, wherein said barrier wall is a flat annular surface disposed in a plane oriented perpendicular to said longitudinal axis of said connection stem.

5. A system as recited in Claim 2, wherein said barrier wall of said enlargement forms an undercut into said enlargement at said proximal end thereof.

6. A system as recited in Claim 5, wherein said barrier wall is a proximally facing frustoconical surface enlarging radially outwardly in a proximal direction from said exterior of said connection stem to said proximal end of said enlargement.

7. A system as recited in Claim 2, wherein said barrier wall is a generally inclined surface enlarging radially outwardly in a distal direction from said exterior of said connection stem to said proximal end of said enlargement.

8. A system as recited in Claim 7, wherein said barrier wall is frustoconical.

9. A system as recited in Claim 2, wherein said locking ring comprises:

- a. a distal face encircling said internal bore of said securement collar; and
- b. an interior surface adjacent to and proximal of said distal face, the minimum radius of said interior surface being greater than the maximum radius of said enlargement about said longitudinal axis of said connection stem.

10. A system as recited in Claim 9, wherein said distal face of said locking ring is generally perpendicular to said longitudinal axis of said securement collar.

11. A system as recited in Claim 10, wherein said distal face of said locking ring is a flat annular surface disposed in a plane perpendicular to said longitudinal axis of said securement collar.

12. A system as recited in Claim 9, wherein said interior surface of said locking ring is cylindrical.

13. A system as recited in Claim 2, wherein said enlargement comprises a frustoconical barb, the outer surface of said barb enlarging radially outwardly in a proximal direction about said distal end of said connection stem to a shoulder of said barb at said barrier wall.

14. A system as recited in Claim 13, wherein said barb is located at said tip of said distal end of said connection stem.

15. A system as recited in Claim 14, wherein said enlargement further comprises a secondary barb between said frustoconical barb and said tip of said distal end of said connection stem.

16. A system as recited in Claim 2, wherein said enlargement comprises:

- a. a primary barb; and
- b. a secondary barb located distally of said primary barb.

17. A system as recited in Claim 16, wherein the maximum radius of said secondary barb is greater than the maximum radius of said primary barb.

18. A system as recited in Claim 2, wherein said exterior of said connection stem proximal of said enlargement is cylindrical.

19. A system as recited in Claim 2, wherein said exterior of said connection stem proximal of said enlargement is a frustoconical surface enlarging radially outwardly in a proximal direction.

20. A system as recited in Claim 2, wherein in said assembled condition of said connection system, said internal bore of said securement collar proximal of said enlargement cooperates with said exterior of said connection stem to form a void encircling said connection stem interior of said connection system, said void having an enlarged closed proximal end and a smaller distal end opening to the exterior of said connection system between said securement collar and said exterior of said connection stem.

21. A system as recited in Claim 20, wherein said exterior of said connection stem proximal of said enlargement is a frustoconical surface enlarging radially outwardly in a proximal direction.

22. A system as recited in Claim 20, wherein said exterior of said connection stem proximal of said enlargement is cylindrical, and said void has:

- a. a constant inner diameter corresponding to said exterior of said connection stem proximal of said enlargement; and
- b. a minimum outer diameter at said distal end of said void.

23. A system as recited in Claim 1, wherein said securement collar and said connection stem are reusably disassemblable out of said assembled condition of said connection system.

24. A system as recited in Claim 1, wherein said securement collar is a circumferentially continuous tubular structure.

25. A system as recited in Claim 2, further comprising attachment means for securing the proximal end of said securement collar in engagement with said exterior of said connection stem.

26. A system as recited in Claim 25, wherein said attachment means comprises:

a. a first set of threads on the exterior of said connection stem proximal of and remote from said enlargement; and

b. a second set of threads on a portion of said internal bore of said securement collar encircling and opposing said first set of threads on said connection stem in said assembled condition of said connection system, said second set of threads being configured to cooperate with said first set of threads in rotatingly advancing said securement collar proximally along said exterior of said connection stem into said assembled condition of said connection system.

27. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a user into an assembled condition, and said connection system comprising:

a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the

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catheter when said distal end of said connection stem is received therein, said connection stem comprising:

i. a frustoconical barb formed on the exterior of said distal end of said connection stem, the outer surface of said barb enlarging radially outwardly about said distal end of said connection stem in a proximal direction to a shoulder of said barb, said barb terminating at said shoulder thereof in a flat annular barrier wall encircling said connection stem and disposed in a plane oriented perpendicular to the longitudinal axis of said connection stem, said barrier wall having a circular inner periphery and a concentric outer periphery coincident with said shoulder of said barb; and

ii. a cylindrical portion of said connection stem adjacent to and proximal of said barrier wall, the outer surface of said cylindrical portion being concentrically disposed about said longitudinal axis of said connection stem with a radius equal to the radius of said inner periphery of said barrier wall; and

b. a catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with said longitudinal axis of said connection stem, said securement collar comprising:

i. a proximal end capable of engaging said exterior of said connection stem in said assembled condition of said connection system; and



ii. a catheter locking ring on the interior of said securement collar remote from said proximal end thereof, said locking ring comprising:

A. a flat distal face disposed in a plane perpendicular to said longitudinal axis of said securement collar; and

B. a cylindrical interior surface adjacent to and proximal of said distal face, the radius of said interior surface being greater than the radius of said outer periphery of said barrier wall of said barb about said longitudinal axis of said connection stem, the inner diameter of said internal bore of said securement collar being at a minimum at said locking ring, and said locking ring in said assembled condition of said connection system being positioned proximal of said shoulder of said barb concentrically encircling said cylindrical portion of said connection stem, thereby with said distal end of said connection stem received in the lumen of the catheter:

(1) subjecting the portion of the outer wall of the catheter disposed between said interior surface of said locking ring and said cylindrical portion of said connection stem to a condition of maximum compression produced in the outer wall of the catheter by said connection system; and

(2) producing distally from said interior surface of said locking ring a tortuous path for the outer wall of the catheter between said distal face of said locking ring and said barrier wall of said barb, about said shoulder of said barb, and distally along the portion of said outer surface of said barb adjacent said shoulder thereof.

28. A system as recited in Claim 27, wherein said locking ring is located at the distal end of said securement collar.

29. A system as recited in Claim 27, further including a rounded fillet between the distal end of said barb and said tip of said distal end of said connection stem.

30. A system as recited in Claim 27, wherein in said assembled condition of said connection system, said internal bore of said securement collar proximal of said locking ring cooperates with said outer surface of said cylindrical portion of said connection stem to form a void encircling said connection stem interior of said connection system, said void having an enlarged closed proximal end and a smaller distal end opening to said exterior of said connection system between said locking ring and said cylindrical portion of said connection stem.

31. A system as recited in Claim 27, further comprising attachment means for securing said proximal end of said securement collar in engagement with said exterior of said connection stem.

32. A system as recited in Claim 31, wherein said attachment means for securing comprises:

a. a first set of threads on said exterior of said connection stem proximal of said cylindrical portion thereof; and

b. a second set of threads on a portion of said internal bore of said securement collar encircling and opposing said first set of threads on said connection stem in said assembled condition of said connection system, said second set of threads being configured to cooperate with said first set of threads in rotatingly advancing said securement collar proximally along said exterior of said connection stem into said assembled condition of said connection system.

33. A system as recited in Claim 27, wherein said securement collar and said connection stem are reusably disassemblable out of said assembled condition thereof.

34. A system as recited in Claim 27, wherein the medical device is a coupling hub for attaching the catheter to other medical equipment.

35. A system as recited in Claim 27, wherein the medical device is a subcutaneously implantable vascular access port.

36. A system as recited in Claim 27, wherein the medical device is a replacement hub of a catheter repair kit.

37. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a user into an assembled condition, and said connection system comprising:

a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the catheter when said distal end of said connection stem is received therein, said connection stem comprising a first set of threads on the exterior of said proximal end of said connection stem;

b. a catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with the longitudinal axis of said connection stem, said securement collar comprising:

- i. a proximal end;
- ii. a second set of threads on said internal bore of said securement collar at said proximal end thereof, said second set of threads being configured to cooperate with said first set of threads in rotatingly advancing said securement collar proximally along said exterior of said connection stem into said assembled condition of said connection system; and
  - iii. a distal end located at a longitudinal distance along said securement collar from said second set of threads, said longitudinal distance being less than the longitudinal distance of said tip of said distal end of said connection stem from said first set of threads; and
- c. purchase enhancement means for retaining a securement lip of catheter material from the outer wall of the catheter internal of said connection system in said assembled condition thereof with said distal end of said connection stem received in the lumen of the catheter.

38. A system as recited in Claim 37, wherein said purchase enhancement means comprises a void internal to said connection system in said assembled condition thereof formed between said exterior surface of said connection stem and a purchase enhancement region of said internal bore of said securement collar located intermediate said distal end thereof and said second set of threads, the internal diameter of said purchase enhancement region of said internal bore of said securement collar increasing in a proximal direction longitudinally along said securement collar more rapidly than any increase in the outer diameter of said exterior of said connection stem opposite said purchase enhancement region.

39. A system as recited in Claim 38, wherein:

a. said exterior of said connection stem opposite from said purchase enhancement region of said internal bore of said securement collar in said assembled condition of said catheter connection system is cylindrical; and

b. said void has a constant inner diameter, a closed proximal end, and a minimum outer diameter at said distal end of said securement collar.

40. A system as recited in Claim 38, wherein said exterior of said connection stem opposite said purchase enhancement region of said internal bore of said securement collar in said assembled condition of said connection system enlarges radially outwardly in a proximal direction.

41. A system as recited in Claim 37, further comprising an enlargement formed on the exterior of said distal end of said connection stem, said enlargement terminating at a proximal end thereof in a barrier wall encircling said connection stem.

42. A system as recited in Claim 41, wherein said enlargement comprises a frustoconical barb, the outer surface of said frustoconical barb enlarging radially outwardly in a proximal direction about said distal end of said connection stem to a shoulder of said barb at said barrier wall.

43. A system as recited in Claim 42, wherein said enlargement further comprises a secondary barb between said frustoconical barb and said tip of said distal end of said connection stem.

44. A system as recited in Claim 41, wherein said enlargement comprises:

- a. a primary barb; and
- b. a secondary barb located distally of said primary barb.

45. A system as recited in Claim 41, further comprising a catheter locking ring on the interior of said securement collar at said distal end thereof, said locking ring in said assembled condition of said connection system being positioned proximal of said enlargement on said connection stem encircling said exterior of said connection stem.

46. A system as recited in Claim 45, wherein said locking ring comprises:

- a. a distal face encircling said internal bore of said securement collar; and
- b. an interior surface adjacent to and proximal of said distal face, the minimum radius of said interior surface being greater than the maximum radius of said enlargement about said longitudinal axis of said connection stem.

47. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a user into an assembled condition, and said connection system comprising:

- a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the catheter when said distal end of said connection stem is received therein, said connection stem comprising a first set of threads on the exterior of said proximal end of said connection stem;



b. a catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with the longitudinal axis of said connection stem, said securement collar comprising:

- i. a proximal end;
- ii. a second set of threads on said internal bore of said securement collar at said proximal end thereof, said second set of threads being configured to cooperate with said first set of threads in rotatingly advancing said securement collar proximally along said exterior of said connection stem into said assembled condition of said connection system; and
- iii. a distal end located at a longitudinal distance along said securement collar from said second set of threads, said longitudinal distance being less than the longitudinal distance of said tip of said distal end of said connection stem from said first set of threads, in said assembled condition of said connection system said internal bore of said securement collar proximal of said distal end of said securement collar cooperating with said exterior of said connection stem to form a void encircling said connection stem interior of said connection system, said void having an enlarged closed proximal end and a smaller distal end opening to said exterior of said connection system between said distal end of said securement collar and said exterior of said connection stem.

48. A system as recited in Claim 47, further comprising a barb formed on the exterior of said distal end of said connection stem enlarging radially outwardly in a proximal direction about said distal end of said connection stem to a shoulder of said barb.

49. A system as recited in Claim 48, further comprising a catheter locking ring on the interior of said securement collar at said distal end thereof, said locking ring comprising:

a. a flat distal face disposed in a plane perpendicular to said longitudinal axis of said securement collar; and

b. a cylindrical interior surface adjacent to and proximal of said distal face, the radius of said interior surface being greater than the maximum radius of said barb about said longitudinal axis of said connection stem.

50. A system as recited in Claim 49, wherein said barb terminates at said shoulder thereof in a barrier wall encircling said connection stem and disposed in a plane oriented perpendicular to said longitudinal axis of said connection stem, said barrier wall having a circular inner periphery and a concentric outer periphery coincident with the radially outward limit of said shoulder of said barb.

51. A system as recited in Claim 50, wherein said connection stem further comprises a cylindrical portion adjacent to and proximal of said barb, the outer surface of said cylindrical portion being concentrically disposed about said longitudinal axis of said connection stem with a radius equal to the radius of said inner periphery of said barrier wall.

52. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a wall into an assembled condition, and said connection system comprising:

a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the catheter when said distal end of said connection stem is received therein, said connection stem comprising;

i. a cylindrical portion of said connection stem proximal of said tip of said distal end of said connection stem, the outer surface of said cylindrical portion being concentrically disposed about the longitudinal axis of said connection stem;

ii. a first set of threads on said exterior of said connection stem adjacent to and proximal of said cylindrical portion thereof;

iii. an enlargement formed on the exterior of said distal end of said connection stem proximal of and adjacent to said cylindrical portion, said

enlargement terminating at a proximal end thereof in a barrier wall encircling said connection stem.

b. a tubular catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with said longitudinal axis of said connection stem, said securement collar comprising:

i. a second set of threads on a portion of said internal bore of said securement collar encircling and opposing said first set of threads on said connection stem in said assembled condition of said connection system, said second set of threads being configured to cooperate with said first set of threads in rotatingly advancing said securement collar proximally along said exterior of said connection stem into said assembled condition of said connection system; and

ii. a distal end located at a longitudinal distance along said securement collar from said second set of threads, said longitudinal distance being less than the longitudinal extent of said cylindrical portion of said connection stem.

53. A system as recited in Claim 52, wherein in said assembled condition of said connection system said internal bore of said securement collar cooperates with said outer surface of said cylindrical portion of said connection stem to form a void encircling said connection stem interior of said connection system, said void having a constant inner diameter, a closed proximal end, and a minimum outer diameter at said distal end of said securement collar.

54. A system as recited in Claim 52, further comprising a catheter locking ring on the interior of said securement collar at said distal end thereof, the inner diameter of said internal bore of said securement collar being at a minimum at said locking ring.

55. A system as recited in Claim 54, wherein said locking ring comprises:

- a. a flat distal face disposed in a plane perpendicular to said longitudinal axis of said securement collar; and
- b. a cylindrical interior surface adjacent to and proximal of said flat distal face, the radius of said interior surface being greater than the maximum radius of said enlargement about said longitudinal axis of said connection stem.

56. A system as recited in Claim 52, wherein said enlargement comprises a barb formed on said exterior of said distal end of said connection stem, the outer surface of said barb enlarging radially outwardly about said distal end of said connection stem proximally to a shoulder of said barb at said barrier wall.

57. A system as recited in Claim 56, wherein said barrier wall is disposed in a plane oriented perpendicular to said longitudinal axis of said connection stem, and said barrier wall has a circular inner periphery and a concentric outer periphery, said outer periphery of said barrier wall being coincident with the radially outward limit of said shoulder of said barb.

58. A system as recited in Claim 52, wherein said barrier wall is frustoconical.

59. A system as recited in claim 56, wherein said enlargement further comprises a secondary barb between said barb and said tip of said distal end of said connection stem.

60. A system as recited in claim 52, wherein said enlargement comprises:

- a. a primary barb; and
- b. a secondary barb located distally of said primary barb.

61. A system as recited in claim 60, wherein the maximum radius of said secondary barb is greater than the maximum radius of said primary barb.

62. A system as recited in claim 52, wherein said barrier wall of said enlargement is oriented generally perpendicularly to said longitudinal axis of said connection stem.

63. A system as recited in claim 62, wherein said barrier wall is a flat annular surface disposed in a plane oriented perpendicular to said longitudinal axis of said connection stem.

64. A system as recited in claim 52, wherein said barrier wall of said enlargement forms an undercut into said enlargement at said proximal end thereof.

65. A system as recited in claim 64, wherein said barrier wall is a proximally facing frustoconical surface enlarging radially outwardly in a proximal direction from said exterior of said connection stem to said proximal end of said enlargement.

66. A system as recited in claim 52, wherein said barrier wall is a generally inclined surface enlarging radially outwardly in a distal direction from said exterior of said connection stem to said proximal end of said enlargement.

67. A system as recited in claim 66, wherein said barrier wall is frustoconical.

68. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a cardiovascular access catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a user into an assembled condition, and said connection system comprising:

a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the catheter when said distal end of said connection stem is received therein, said connection stem comprising:

i. a barb formed on the exterior of said distal end of said connection stem, the outer surface of said barb enlarging radially outwardly about said distal end of said connection stem proximally from said tip of said distal end of said connection stem to a shoulder of said barb, said barb terminating at said shoulder thereof in a barrier wall oriented generally perpendicularly to the longitudinal axis of said connection stem, said barrier wall having a circular inner periphery and an outer periphery coincident with the radially outward limit of said shoulder of said barb; and



- ii. a cylindrical portion of said connection stem adjacent to and proximal of said barrier wall, the outer surface of said cylindrical portion being concentrically disposed about said longitudinal axis of said connection stem and having a radius equal to the radius of said inner periphery of said barrier wall; and
- b. a catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with said longitudinal axis of said connection stem, said securement collar comprising:
  - i. a proximal end capable of engaging said exterior of said connection stem in said assembled condition of said connection system; and
  - ii. pinching means for urging a portion of the outer wall of the catheter against said outer surface of said cylindrical portion of said connection stem to create thereat in said portion of the outer wall of the catheter a longitudinally uniform condition of maximum compression produced in the outer wall of the catheter by said connection system.

69. A system as recited in Claim 68, wherein said pinching means comprises a catheter locking ring on the interior of said securement collar remote from said proximal end thereof, said locking ring comprising:

- a. a distal face encircling said internal bore of said securement collar; and
- b. a cylindrical interior surface adjacent to and proximal of said distal face, the radius of said interior surface of said locking ring being greater than the radius of said outer periphery of said barrier wall of said barb about said longitudinal axis of said connection stem, the inner diameter of said internal bore of said securement collar being at a minimum at said locking ring, and said locking ring in said assembled condition of said connection system being positioned proximal of said shoulder of said barb concentrically encircling said cylindrical portion of said connection stem.

70. A system as recited in Claim 69, wherein in said assembled condition of said connection system, a tortuous path is produced for the outer wall of the catheter distally from said interior surface of said locking ring between said distal face of said locking ring and said barrier wall of said barb, about said shoulder of said barb, and distally along the portion of said outer surface of said barb adjacent said shoulder thereof.

71. A system as recited in Claim 69, wherein said distal face of said locking ring is generally perpendicular to said longitudinal axis of said securement collar.

72. A system as recited in Claim 71, wherein said distal face of said locking ring is a flat annular surface disposed in a plane perpendicular to said longitudinal axis of said securement collar.

73. A system as recited in Claim 68, wherein said barb is frustoconical.

74. A system as recited in Claim 68, further comprising:

a. a first set of threads on said exterior of said connection stem proximal of said cylindrical portion thereof; and

b. a second set of threads on a portion of said internal bore of said securement collar encircling and opposing said first set of threads on said connection stem in said assembled condition of said connection system, said second set of threads being configured to cooperate with said first set of threads in rotatingly advancing said securement collar proximally along said exterior of said connection stem into said assembled condition of said connection system.

75. A system as recited in Claim 68, wherein the medical device is a coupling hub for attaching the catheter to other medical equipment.

76. A system as recited in Claim 68, wherein the medical device is a subcutaneously implantable vascular access port.

77. A system as recited in Claim 68, wherein the medical device is a replacement hub of a catheter repair kit.

78. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a user into an assembled condition, and said connection system comprising:

a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the catheter when said distal end of said connection stem is received therein, said connection stem comprising:

i. a barb formed on the exterior of said distal end of said connection stem, the outer surface of said barb enlarging radially outwardly about said distal end of said connection stem proximally to a shoulder of said barb; and

ii. a first set of threads on said exterior of said connection stem proximal of and remote from said barb; and

b. a catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with the longitudinal axis of said connection stem, said securement collar comprising:

- i. a proximal end;
- ii. a catheter locking ring on the interior of said securement collar remote from said proximal end thereof, said locking ring having a cylindrical interior surface, the radius of said interior surface being greater than the maximum radius of said barb about said longitudinal axis of said connection stem; and
- iii. a second set of threads on said internal bore of said securement collar at said proximal end thereof, said second set of threads being configured to cooperate with said first set of threads in rotatably advancing said locking ring of said securement collar proximally along said exterior of said connection stem, over said barb on said connection stem, and into said assembled condition of said connection system.

79. A system as recited in Claim 78, wherein said locking ring further comprises a distal face adjacent to and distal of said interior surface of said locking ring encircling said internal bore of said securement collar, thereby in said assembled condition of said connection system with said distal end of said connection stem received in the lumen of the catheter producing distally from said interior surface of said locking ring a tortuous path for the outer wall of the catheter between said distal face of said locking ring and said shoulder of said barb, around said shoulder of said barb, and distally along the portion of said outer surface of said barb adjacent said shoulder thereof.

80. A system as recited in Claim 79, wherein said distal face of said locking ring is disposed in a plane perpendicular to said longitudinal axis of said securement collar.

81. A system as recited in Claim 78, wherein in said assembled condition of said connection system said internal bore of said securement collar proximal of said locking ring cooperates with said exterior of said connection stem to form a void encircling said connection stem interior of said connection system, said void having an enlarged closed proximal end and smaller distal end opening to said exterior of said connection system between said locking ring and said exterior of said connection stem.

82. A system as recited in Claim 81, wherein said exterior of said connection stem proximal of said barb is cylindrical, and said void has:

- a. a constant inner diameter corresponding to said exterior of said connection stem proximal of said barb; and
- b. a minimum outer diameter at said distal end of said void.

83. A catheter connection system for effecting a fluid-tight coupling and a mechanical joiner between a medical device that accommodates fluid flow therethrough and a free end of a catheter having an outer wall with an exterior surface and an interior surface, the interior surface of the outer wall of the catheter defining a longitudinally extending fluid flow lumen within the catheter, said connection system being capable of being manipulated by a user into an assembled condition, and said connection system comprising:

- a. an elongated catheter connection stem attached at the proximal end thereof to the medical device and having a distal end remote therefrom configured to be receivable in the lumen of the catheter, said connection stem enclosing a fluid passageway extending between said proximal end and the tip of said distal end thereof, said fluid passageway communicating with the medical device at said proximal end of said connection stem and with the exterior of said connection stem at a location positioned inside the lumen of the catheter when said distal end of said connection stem is received therein, said connection stem comprising:
  - i. an enlargement formed on the exterior of said distal end of said connection stem, said enlargement terminating in a proximal direction in a barrier

wall encircling said connection stem and oriented generally perpendicularly to the longitudinal axis of said connection stem; and

ii. a cylindrical portion of said connection stem adjacent to and proximal of said barrier wall, the outer surface of said cylindrical portion being concentrically disposed about said longitudinal axis of said connection stem; and

b. a catheter securement collar having an internal bore sized to receive said connection stem and to advance proximally along said exterior thereof from said distal end thereof into said assembled condition of said connection system, in said assembled condition of said connection system the longitudinal axis of said securement collar coinciding with said longitudinal axis of said connection stem, said securement collar comprising:

i. a proximal end; and

ii. a catheter locking ring on the interior of said securement collar distal of and remote from said proximal end thereof, said locking ring comprising a cylindrical interior surface concentrically disposed about said longitudinal axis of said securement collar, the radius of said interior surface being greater than the maximum radius of said enlargement about said longitudinal axis of said connection stem.

84. A system as recited in Claim 83, further comprising translation means for advancing said locking ring proximally over said enlargement on said connection stem.



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85. A system as recited in Claim 84, wherein said translation means comprises:
- a. a first set of threads on said exterior of said connection stem proximal of said cylindrical portion thereof; and
  - b. a second set of threads on a portion of said internal bore of said securement collar encircling and opposing said first set of threads on said connection stem in said assembled condition of said connection system, said second set of threads being configured to cooperate with said first set of threads in rotatingly advancing said securement collar proximally along said exterior of said connection stem into said assembled condition of said connection system.

86. A system as recited in Claim 83, further comprising a distal face on said catheter locking ring adjacent to and distal of said interior surface of said catheter locking ring, said distal face being disposed generally perpendicularly to said longitudinal axis of said securement collar, thereby in said assembled condition of said connection system producing distally from said interior surface of said locking ring a tortuous path for the outer wall of the catheter between said distal face of said catheter locking ring and said barrier wall of said enlargement, around said enlargement, and along the portion of the outer surface of said enlargement adjacent said barrier wall.

87. A system as recited in Claim 83, wherein said enlargement comprises a frustoconical barb, the outer surface of said barb enlarging radially outwardly about said distal end of said connection stem proximally to a shoulder of said barb at said barrier wall.